

# **STANDARD AUTONOMOUS FILE SERVER SAFS**

## **Product Plan**

**Version 1.1  
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# SAFS Product Plan

## Version 1.1

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## 1.0 Introduction

This document is intended to describe the plan for the development of the Standard Autonomous File Server (SAFS) and is derived from the SAFS Project Management Plan Version 1.1.

### 1.1 Purpose

The purpose of the SAFS effort is to create an operational system which will provide automated management of large data files which are the result of mission specific data functions. In addition, the SAFS will provide customers access to these files in a timely fashion without interfering with the assets involved in the acquisition and processing of the data. The purpose of this document is to describe the approach to be taken to accomplish this effort and to describe the highest level requirements to be met.

### 1.2 Background

The Advanced Earth Observing Satellite (ADEOS) II working group initiated the SAFS project, which will be a separate effort from ADEOS-II, but will be supporting ADEOS-II, among others, as its first customers.

The SAFS system will be an autonomous intermediary between ground stations and their data customers who have requirements that can not be managed by non-electronic media distribution. It will benefit the customers, whose systems usually lack the robustness required to handle unsolicited data transfers from increasingly automated ground stations. It will also benefit the operational ground stations, which are usually not well equipped to handle non-real time, non-operational interactions resulting from customer systems' data requests. The SAFS system will use standard protocols and Commercial Off-the-Shelf (COTS) products wherever possible as it ingests and manages down linked data, while enhancing reliability and preserving autonomous file handling from customer systems where required.

The benefits from the use of the SAFS system will be increased data distribution in a more flexible, reliable and timely fashion, as well as additional automation of ground station activities. The SAFS system will also have merit in an operational range environment to give experimenters and other relevant personnel access to raw vehicle data without interfering with the operation of range systems. By using standard protocols and COTS products wherever possible, the SAFS system could be a standard resource in any large transaction based system in which the data source is real time and time-constraints dictate non-interference by external access.

### 1.3 Product Plan Review and Update

The National Aeronautics and Space Administration (NASA) Ground Network (GN) project lead and the Code 584 manager shall review this document. In addition, this document will be made available for review to the leads of those projects using or anticipating using the SAFS system.

This document has been developed by and shall be maintained by the SAFS Team, as defined in section 3.3. It may be updated to reflect changes in supported project objectives. The GN Project Lead, the Code 584 manager, and the SAFS Product Development Lead (PDL) have to approve any changes to this document.

## 2.0 Customer Agreement

This section describes the agreement between the SAFS customer and the SAFS Team including those issues related to requirements, deliverables, and maintenance.

### 2.1 Customer Identification

The preliminary primary customers for the products developed by this effort are NASA GN and its customers.

### 2.2 Customer Goals and Objectives

The customer's objective with respect to the SAFS system is to be provided with increased data distribution in a more flexible, reliable and timely fashion.

### 2.3 Requirements

The SAFS system will operate with a high degree of autonomy such that nominal operations will require no human interaction for file acquisitions, file transmissions, email transactions, disk management, or performance reporting.

Satisfaction of requirements with respect to file acquisition and distribution is required for ADEOS-II and other approved missions, as defined in each respective missions' Detailed Mission Requirements (DMR) documents. These requirements are summarized for each approved project in the *SAFS Project Interface Document* and the *Preliminary Project Information Forms for SAFS Support*, all of which have links on the SAFS web page at <http://www.wff.nasa.gov/~websafs/>.

### 2.4 Deliverables

The products to be delivered to the NASA GN by the conclusion of this project include the SAFS hardware and software; an operations document for monitoring, maintenance and emergency procedures; system documentation; configuration management records; and all quality records.

There are two phases for deliverables: the installation and testing of the ground station SAFS for single project support; and, the installation and testing for multiple project support and non-ground station SAFS systems. This will result in overlapping periods of operations, development, and project additions.

### 2.5 Necessary Customer Training

The customers will be trained in emergency operating and monitoring procedures for the SAFS system at their location.

### 2.6 Medium for Product Delivery

COTS and custom software will be incorporated into the SAFS system while in the development lab and then deployed to each of the participating NASA GN tracking stations. Subsequent system builds will be accomplished through electronic data transfers.

### 2.7 Product Destination

The Central SAFS system will be located at the NASA Integrated Systems Network (NISN) Building at Greenbelt, Maryland, and will be the facility for customer acquisition of ground station acquired files.

The ground station SAFS will be located at NASA GN stations in Virginia's NASA Wallops Flight Facility (WFF), Alaska's Poker Flat Research Range, Svalbard (Norway), and McMurdo (Antarctica). A system to support

the ADEOS-II project will be located at the Synthetic Aperture Radar (SAR) facility at the University of Alaska in Fairbanks, and will have the capability to both acquire files and provide customer file acquisition.

## **2.8 Post Delivery Maintenance**

Maintenance and integration of the SAFS software will be the responsibility of the SAFS PDL. All modifications to the SAFS software needed to address bug fixes, enhancements, and upgrades will be performed or managed by the SAFS Team. All software maintenance requests should be made to the SAFS Team via phone or email. The SAFS Team will analyze any reported problems and will issue Configuration Change Request (CCR)'s for approval to resolve identified problems to the Earth Observing System (EOS) Polar Ground Network (EPGN) Configuration Management Board (ECMB) for those systems under GN control. These requests are made through the EOS Polar Ground Station (EPGS) maintenance database, which is linked to <http://ses.stel.com:8080/EPGS/index.htm>.

Installation of new software modules may be accomplished by either direct or remote installation. In general, following delivery and acceptance of the systems, the SAFS Team will perform installation. Hardware maintenance will be performed by either trained ground station personnel or through on-site support contracts.

During the initial development phase, the SAFS Team will be the initial point of contact for ground station personnel needing vendor hardware support. During the second phase when the ground station SAFS systems are operational, the SAFS Team will be the point of contact for ground station personnel to obtain Consolidated Space Operations Center (CSOC) hardware support. When all phases of the SAFS development are complete, a procedure for obtaining CSOC hardware support will be provided as part of the operations document.

## **2.9 Customer Supplied Elements**

This section describes those elements of the SAFS development effort that are to be supplied by the customer.

### **2.9.1 Funding**

The customer shall provide all funding necessary to complete the project. This includes funding for all hardware, software, personnel, and facility equipment required for the project.

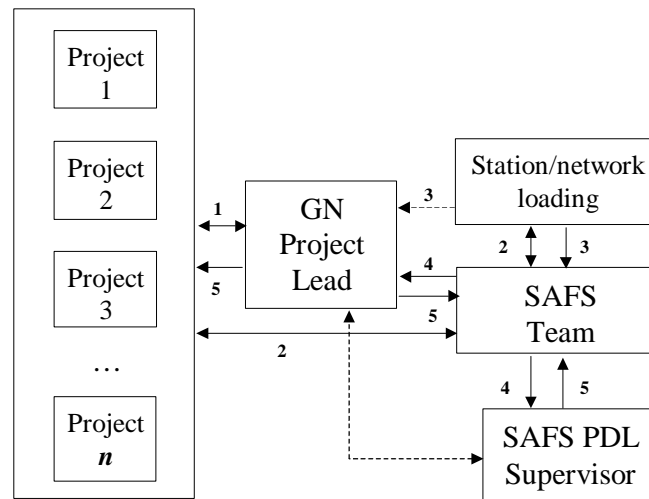
## **2.10 Customer Involvement**

This section describes the involvement of the SAFS Team and customer personnel that will be required to insure that the product delivered meets the requirements. The customer shall be the primary point of contact for the development of a concise list of requirements and functional specifications. Throughout the development of the SAFS system, the customer will continue to serve as a point of contact for questions regarding detailed requirements and operation concepts. The customer shall review all SAFS documentation, including requirements and design reports.

### **2.10.1 GN Project Lead**

The GN Project Lead is responsible for reviewing the progress, status, and proposals from the SAFS PDL to determine that they meet the requirements for the immediate as well as near-future missions, and to advise when deficiencies, inaccuracies, or problems are apparent.

The GN Project Lead also approves all new project requests to utilize the SAFS system. The following chart illustrates the process by which new projects are approved for SAFS support:



1. First contact from new project with permission for assessment.
2. Project requirements/resources identified.
3. External impact assessment and recommendations.
4. SAFS impact assessment and recommendations.
5. Approval/disapproval for new project support.

### 2.10.2 GN Element Lead

Each GN Element Lead is responsible for reviewing the progress, status, and proposals from the SAFS PDL to determine that they meet the requirements for the immediate as well as near-future missions, and to advise when deficiencies, inaccuracies, or problems are apparent.

### 2.10.3 Project-Specific Project Lead

Each Project Lead is responsible for reviewing the progress, status, and proposals from the SAFS PDL to determine that they meet the requirements for their immediate as well as near-future missions, and to advise when deficiencies, inaccuracies, or problems are apparent. In addition, each Project Lead is responsible for providing their mission's requirements for the SAFS system, and will work closely with the SAFS PDL in developing a testing plan to determine whether the SAFS system meets its functional and operational requirements for launch.

### 2.10.4 Project-Specific Telemetry Processor Lead

Each Telemetry Processor Lead is responsible for the dissemination of requirements and capabilities of their mission's telemetry processor as it affects the design and operation of the SAFS system. In addition, each Telemetry Processor Lead is responsible for providing data during the testing phase to verify that communications and file transfer requirements are being met between their telemetry processor and the SAFS system. Each Telemetry Processor Lead will also be instrumental in helping to design failure procedures, reporting routines, and other operational procedures that affect the SAFS system.

## 2.11 Customer Communications

Communication with the customer will be carried out in a variety of forms. The SAFS PDL will report progress, status, and proposals to the GN Project Lead and to the GN Element Leads. In particular, the SAFS PDL will



coordinate activities with the lead of the primary customer project, ADEOS-II, and other project leads as required.

## **2.12 Authority for Changes**

All changes to the requirements for the project required or requested by the customer should be forwarded to the SAFS PDL in writing, with email being the preferred mode of communication. The SAFS Team will evaluate any requested changes and determine their feasibility.

The SAFS Team will notify all customers in writing of any changes to the design or implementation schedule that may affect their projects. Written authorization for or concurrence with the proposed changes by the customer will be required. The SAFS PDL has the final authority on all changes to the SAFS system.

## **2.13 Acceptance Criteria**

This product will be determined to be complete for single project support when the customer accepts it. A formal **SAFS Release Notice**, signed by the GN Project Lead and the SAFS PDL, will become a part of the SAFS project's quality records.

Supporting evidence of the product's readiness for acceptance will be provided by the SAFS Team and will demonstrate the functionality of all features of the system that correspond to the documented system requirements. A complete project demonstration of the system will be performed during scheduled project integration and testing (I&T) procedures.

A project's debriefing message after it's element testing will signify whether the SAFS system successfully performs the test requirements itemized in the project's briefing message. Any nonconformance in the test elements will be noted in the project's debriefing message. The SAFS Team will investigate all alleged nonconformities and determine the severity of the problem and issue CCR's as needed.

## **2.14 Customer Agreement Review and Update Process**

Either the customer or the SAFS Team may initiate changes to the requirements. All changes must be requested electronically to the SAFS PDL. Requested changes will be reviewed and must be approved by the SAFS Team. The ECMB must also approve changes to any GN-controlled SAFS systems before they are implemented. The SAFS PDL has the final authority on all changes to the SAFS systems. The SAFS PDL is responsible for reporting changes to the GN Project Lead and the GN Element Leads and updating any affected documentation.

## 3.0 Management Approach

This section describes the management approach that will be employed in the SAFS development effort.

### 3.1 General Development Approach

The general development approach of the SAFS Team will maximize the use of COTS products and government developed products that have been successfully employed for similar projects. These will be evaluated, and if appropriate, reused for this effort, with scripting as the primary method for adaptation. Because the Quick Scatterometer (QuikSCAT) project requires SAFS to be operational in less than one year, waterfall methodology will be employed with prototyping where feasible.

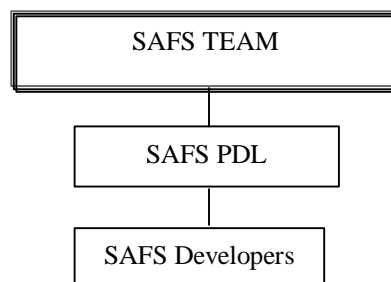
### 3.2 Resources Needed

The manpower employed to support this effort will be drawn from WFF's Code 584, and the contractor personnel supporting that group. For the duration of the project, the SAFS Team will not exceed 2 contractors with one civil servant, who will work the SAFS schedule. This project is among the projects of highest priority that are supported by that work force, with the exception of launch critical modifications to systems supporting scheduled WFF launch campaigns. The most crucial driver of this effort is schedule. Reuse in other ground station and launch support systems is a secondary driver.

### 3.3 Team Organization

This section describes the organization and purpose of the SAFS Team.

#### 3.3.1 Team Organization Chart



#### 3.3.2 Team Charter

The SAFS Team will meet or exceed its customers' requirements and achieve excellence in all of its efforts.

#### 3.3.3 Team Scope

The SAFS Team will design, develop, procure, install, and test all hardware and software necessary for the SAFS System.

#### 3.3.4 Roles, Responsibilities, Authority, Accountability

This section describes the roles and responsibilities of the members and supporting organizations associated with

the SAFS development.

#### **3.3.4.1 SAFS PDL: Susan K. Semancik, Code 584**

The SAFS PDL is responsible for the planning, design, and development of the SAFS system in accordance with project requirements, including overseeing software development and work assignments, hardware and software procurement, and system testing. In addition, the SAFS PDL will provide documentation of the product, status reports as required, and demonstrations of progress as available. This lead must work closely with:

- Project leads to ascertain requirements that might affect the design and/or operation of the SAFS system,
- the Computer Network Lead to determine network requirements that might affect the system design and/or performance,
- the Telemetry Processor Lead to establish file transfer requirements between the telemetry processor and the SAFS system,
- the Engineering and Operations Interface Lead during the installation and testing of the SAFS system in the field, and
- the Computer Network Lead and the Engineering and Operation Interface Lead in determining station and network loading for both actual and potential projects using the SAFS systems.

#### **3.3.4.2 SAFS Developer(s): Annette M. Conger, Computer Sciences Corporation (CSC)**

The SAFS developers are responsible for supporting the SAFS PDL in the design, development, testing, and deployment of the software meeting the requirements of the effort. Work assignments are based on daily team conferences and schedule assessments. In addition, SAFS developers may provide documentation of the product, status reports as required, and demonstrations of progress as available.

### **3.3.5 Decision Making and Conflict Resolution Process**

Design assessments related to the SAFS system will be made by all members of the SAFS Team. In the event of a conflict, the SAFS PDL will have final recommendation authority.

### **3.3.6 External Support**

#### **3.3.6.1 Computer Network Lead**

The Computer Network Lead is the NASA point of contact for the design and implementation of communications networks internal to NASA and for the integration of external communication networks. This lead will also be the point of contact for evaluation of network loading for new projects requesting SAFS support.

#### **3.3.6.2 Engineering and Operations Interface Lead**

The Engineering and Operations Interface Lead is responsible for facilitating a smooth transition of engineered products to an operational environment. This includes coordinating the technical support necessary to perform the actual installation of equipment, cables, and other support necessary for the full installation and testing of the SAFS system. This lead will be the point of contact for evaluation of station loading for new projects requesting SAFS support.

### **3.4 Team Interfaces**

The SAFS Team will interface with the individual project development teams. An Interface Control Document (ICD) defining the data and command interfaces between the project, SAFS, and the ground stations will be generated by the projects and approved by each team.

The SAFS Team will interface with NISN personnel to obtain approval for all proposed network communication.

### **3.5 Development Facilities**

The SAFS System will be developed in the WFF prototyping lab in building N-161.

#### **3.5.1 Modifications of Existing Facilities and Schedules**

No modifications to the facilities will be required for this effort.

#### **3.5.2 Development of New Facilities and Schedules**

No new facilities will be required for this effort.

#### **3.5.3 Physical Security**

The N-161 prototyping lab is a secured room. All government computers are password protected and are on a government owned network.

### **3.6 Procurement**

This section describes the purchases planned for the project.

#### **3.6.1 Procurement Needs and Dates and Contracts Identified from Database**

<b>Description</b>	<b>Expected Purchase Date</b>
Silicon Graphics, Inc. (SGI) Origin 200/2000 servers to serve as the ground station, Central SAFS and prototyping host computers	January 27, 1998
MegaDrive EV-1000 RAID Drive systems to serve as the data storage system for all transferred data.	January 27, 1998
FASTCopy File Transfer Protocol software for automating file transfers on all ground station, central SAFS and prototyping systems	January 27, 1998
First copy of FASTCopy File Transfer Protocol software for primary ADEOS/QuikSCAT customers	January 27, 1998
Maintenance support for all hardware and software	January 27, 1998
Communication cards for dual-homing Central SAFS	January 27, 1998
Rack mountable monitor/keyboard/touch pad unit	February 15, 1998
SGI network expansion for SAFS systems at the University of Alaska SAR Facility (ASF) and the Wallops ground station.	Second quarter, 1999

#### **3.6.2 Reference Procurement Process**

The SAFS Team will use the Center wide process for all of its procurements. Purchases of hardware and/or software costing more than \$2500.00 will be accomplished using the Small Purchases System (SPS). Purchases of hardware and/or software costing less than an approved government credit card holder will accomplish \$2500.00 as a credit card purchase. All purchases will be compliant with Federal Acquisition Regulations.

### **3.7 Team Training Plan**

No additional formal training specific to this project is expected. Informal COTS training will be gained through the use of the product and its documentation.

### 3.8 Risk Mitigation

There are a number of risk factors associated with this effort. Management of these risks is the responsibility of the SAFS PDL in conjunction with the other members of the SAFS Team. In general there are programmatic and technical risks of varying degrees of severity. Major risk areas are identified, classified with respect to severity, and an approach to minimizing each risk is described.

#### 3.8.1 Schedule

The schedule for delivery of the SAFS systems is aggressive in order to meet the requirement of a proposed November 1, 1998 QuikSCAT launch. Mitigation of risk is anticipated by the use of off-the-shelf software, by the SAFS Team's drawing on past programming and scheduling experiences, and holding frequent reviews.

#### 3.8.2 Requirements

Project requirements are defined in each project's DMR document. The SAFS Team will work with each project to determine what changes are needed for SAFS support. *The SAFS Project Interface Document* details the file naming and interface agreements with the current supported projects and is linked to the SAFS web page at <http://www.wff.nasa.gov/~websafs/>.

Each project generates an ICD defining agreements between the project and ground network on operational procedures, including the SAFS system. This document is maintained by each project. The SAFS Team maintains a *Preliminary Project Information Form for SAFS Support* document for each project, which contains the project's network, file, and customer information. The blank form for this document is linked to the SAFS web page at <http://www.wff.nasa.gov/~websafs/>.

#### 3.8.3 Interfacing

The groups responsible for data acquisition systems and network performance at the ground stations can make changes that adversely affect the performance of the SAFS system. These systems should also be under a configuration control board (CCB) so that pending changes can be reviewed for impact on the SAFS system. Regular meetings with the recently formed EPGN status support group will help to keep the SAFS Team knowledgeable of pending events that could affect the SAFS system.

Status reports to project review boards will be provided whenever possible to promote communications between the diverse groups working on each project.

#### 3.8.4 COTS Products

It is important to note that concerns over the use of a COTS product include not only the robustness and appropriateness of the product for the current application, but also the viability of its company for the life-cycle of the project for which it will be used. Also, COTS products should exhibit enough forward-thinking design as to be viable for long-range applications, but should be tested enough in the public arena as to be trusted for mission-critical and/or sensitive applications. Awareness of these concerns will help in determining the suitability of a COTS product for the SAFS project.

#### 3.8.5 Contingency Plans

Sufficient spare parts, maintenance support and/or backup systems must be provided in order to assure operational support continues with minimal impact due to a failure in either the Central SAFS system or the ground station SAFS systems. This is especially critical at the Central SAFS system. It is the distribution point for the project files from the ground station SAFS systems, and its failure will inhibit data availability to project customers. This will also be critical for non-ground station implementations of SAFS, such as the ASF SAFS, that do not use the Central SAFS for customer distribution.

### 3.9 Schedules

The SAFS development schedule showing the key steps and milestones associated with the development effort is linked to the SAFS web page at <http://www.wff.nasa.gov/~websafs/>

### 3.10 List of Controlled Documentation

The SAFS quality records list is linked to the SAFS web page at <http://www.wff.nasa.gov/~websafs/>

### 3.11 Process for Process and Product Metric Analysis

The process of the SAFS development effort will be analyzed through regular reviews of the schedule, budget, and status of the subsystem. Peer reviews and project reviews are anticipated. The SAFS system will be reviewed during formal project testing. The need for statistical techniques has been evaluated, and the SAFS Team has decided that they are not needed.

Metrics to be collected throughout the project are defined in Appendix E of the Information Systems Center (ISC) Product Development Handbook, which is linked at <http://isc.gsfc.nasa.gov/html/iso9001.htm>.

- The schedule will be updated quarterly with justifications for changes to the schedule incorporated in the SAFS status report.
- A spreadsheet has been created to track costs for hardware, software, maintenance support, manpower, training, and travel.
- The size metric for SAFS has been determined to be MEDIUM for the following function types:

<u>Function</u>	<u>Method</u>
I & T	Manual
Temporary data archival	COTS:Fastcopy, UNIX shell scripting
Event logging	COTS:Fastcopy, UNIX shell scripting
Data management and distribution	COTS:Fastcopy, UNIX shell scripting
Status reporting	C, HTML

- Nonconformance reports will be maintained as a quality record, and each will include a description, a reason, and a priority. Nonconformances will be tracked by number and severity, and maintained as a quality record.
- Major system changes will be described and justified in a **SAFS Release Notice**, which will be maintained as a quality record.

The SAFS PDL will be responsible for creation and maintenance of the schedule, cost spreadsheet, the nonconformance reports, and the **SAFS Release Notices**.

All collected metrics will be reviewed and analyzed in accordance with standard ISC procedures for lessons learned, improvements to the system, and for preventative methods to be employed in the life of the system.

## 4.0 Technical Approach

This section describes the technical approach that will be used to develop the SAFS System.

### 4.1 Software Development Plan

The development approach of the SAFS Team will be to maximize the use of COTS products. Some reuse of shell scripts developed for the Wallops Orbital Tracking Information System will be integrated into the SAFS System. Other development may be accomplished using available software development tools.

#### 4.1.1 Major Activities

This section describes the major activities planned in the development of the SAFS. Several phases and products of the effort have been identified. For more information see the SAFS schedule which is included on the SAFS web page at <http://www.wff.nasa.gov/~web.safs/>.

##### 4.1.1.1 Phases

The development of the SAFS system will include three builds. Build 1 includes the single project support requirements, design, procurement, development, installation, and I&T. The description of Build 1 can be found in the *Design and Functional Specifications Document* on the SAFS web page at <http://www.wff.nasa.gov/~web.safs/>. Build 2 will be the implementation of support for multiple projects in the SAFS system, which will include prioritizing simultaneous file transmission requests, and expanding status reporting. Build 3 will automate project additions, deletions and changes.

##### 4.1.1.2 Products Associated with Phases

Within each build, the following phases will be completed:

- The Requirements phase will be completed when the *Design and Functional Specifications* document is completed/updated and accepted.
- The Design phase will be completed when a Peer Design Review has been presented and the design accepted.
- The Procurement phase will be completed when all necessary purchases have been identified and issued.
- The Development phase will be completed when the hardware and software needed for the project has been obtained and integrated into a prototype system that satisfies all preliminary project requirements and a release form has been signed by the GN Project Lead and the SAFS PDL
- The Installation phase will be completed when all SAFS system components are installed at their proper locations, tested, and ready to support the project's I&T.
- The Integration and Test phase will be completed when the supported project's I&T phase has been completed.

#### 4.1.2 Development Methodology

This section describes the methodology that will be employed in the development of this product.

##### 4.1.2.1 Methodology

The SAFS will be developed and delivered in several builds. Periodic peer reviews will be conducted to verify the



design. Prototyping will be used to verify that the design meets project requirements.

#### **4.1.2.2 Development Environment**

The SAFS system will be developed on an SGI workstation and will use the UNIX operating system.

#### **4.1.2.3 Utilized Standards**

None.

#### **4.1.2.4 Utilized COTS Products and Tools**

A single COTS product has been selected for use in the SAFS project. All hardware for all SAFS systems will be off-the-shelf. UNIX operating system shell scripts have been included in the design.

#### **4.1.2.5 Build Strategy**

The system will be developed and released in several builds. Each build will provide significant functional capability, which will be documented in an associated *SAFS Release Notice*, which will be maintained as part of the SAFS quality records.

#### **4.1.2.6 Product Inspection and Test Approach**

Each hardware or software component submitted or procured for integration into the SAFS system will be subjected to verification and validation procedures by the SAFS Team to insure compliance with operation requirements, project requirements, security and year 2000 requirements.

Prior to delivery, a prototype system, including hardware and software, will be tested in a lab environment in WFF, Building N161. Operation in that lab will be used to evaluate performance and to obtain feedback from key personnel with engineering or operational background.

Installation of the SAFS system will be tested and verified under the direction of the Engineering and Operation Interface Lead who will insure compliance with requirements in the ADEOS-II/QuikSCAT environment. The supporting missions have their own test plans for which we track results from the SAFS logs and web reports. Tests of the SAFS systems are conducted by the projects with the support of the SAFS Team as needed. The test team for a project includes affected ground station operators, the SAFS Team, project customers, and project support personnel. Project debriefing test result messages that are sent to the SAFS Team are saved as a quality record for validation purposes.

The following project controlled document related to SAFS testing has been released:

*Mission Readiness Test Plan for the Quick Scatterometer (QuikSCAT) Ground System*, 581-2TP/0198

The SAFS Team performs local end-to-end soak testing whenever changes are made to the SAFS system. This test simulates the arrival of data to the ground station SAFS, which then triggers automated file deliveries and notifications to the Central SAFS and the project customers. The test is considered successful if the results are as expected, and the software is then scheduled for installation at the remaining SAFS sites. Soak test results are kept as a quality record for system verification after changes are made.

#### **4.1.2.7 Acceptance Criteria and Objectives**

A verification checklist has been created by the SAFS Team and is automatically completed by the web reporting software during a project's I&T period. This checklist will be contained in the SAFS Status and Report Page and linked to the SAFS web page at <http://www.wff.nasa.gov/~websafs/>.

#### **4.1.2.8 Reviews Planned**

The key components of the review cycle include a requirements analysis to be performed and documented by the



project requesting SAFS support, peer design reviews, and project readiness reviews. The reviews are scheduled by the projects and subsequent action items notify the SAFS Team of any negative results.

#### **4.1.2.8.1 Requirements Analysis**

The requirements analysis will identify project requirements and assess their completeness, clarity and correctness. The product of this analysis will be the project's DMR, Preliminary Design Review (PDR) and ICD documents.

#### **4.1.2.8.2 Peer Design Reviews**

Peer design reviews will assess the applicability of the specific system design and implementation plan. These reviews will provide an external view of the development effort and will insure that the implementation strategies and designs make maximum use and reuse of COTS and other off-the-shelf systems or technologies, and minimize risks associated with the effort. The SAFS Team will maintain a quality record of action items which result from these reviews.

#### **4.1.2.8.3 Project Readiness Review**

The Project Readiness review will assess the completeness, clarity, and correctness of the SAFS system's implementation with respect to the project's requirements, as well as the specific system design and implementation plan for long-range use. The review will insure that implementation strategies and designs make maximum use and reuse of COTS and other available off the shelf systems. Action items resulting from these reviews are controlled by the project.

### **4.1.3 Process Control**

For each major software release or project addition, a backup tape will be created and stored in a cabinet in Building N161 at Wallops Flight Facility.

### **4.1.4 Incoming Inspection and Test**

Inspection for kind, count, and condition of purchased products is performed on delivery.

Each hardware or software component submitted or procured for integration into the SAFS system will be subjected to verification and validation by the SAFS Team to insure compliance with operation requirements, project requirements, security, and year 2000 requirements. Section 4.1.2.6 contains the SAFS Product Inspection and Test Approach.

Shipping and receiving provides configuration and control through the NASA Equipment Control Numbers (ECN) which the SAFS Team tracks for SAFS procured components as a quality record.

### **4.1.5 Control of Test Equipment**

Control of any test equipment used on the SAFS system will be the responsibility of the organization providing the test equipment.

The SAFS Team performs local end-to-end soak testing whenever hardware or software changes are made to the SAFS system. This test simulates the arrival of data to the ground station SAFS, which then triggers automated file deliveries and notifications to the Central SAFS and the project customers. The test is considered successful if the results are as expected, and the software is then scheduled for installation at the remaining SAFS sites.

## **4.2 Process for Transportation, Identification, and Medium of Product**

The NASA Goddard Space Flight Center (GSFC) process for transportation will be used to transport all SAFS products. A SAFS quality record is maintained for the components of each of the SAFS systems:

- Each hardware component's unique serial number and NASA ECN identifier,
- Each COTS software product license number and installed version number.

After delivery of the system, any system build release will be accomplished through electronic data transfers, and will have a unique incremental number with an associated descriptive ***SAFS Release Notice***, which will be maintained as a SAFS quality record.

#### ***4.3 Technology and Commercialization Plan***

There is no technology and commercialization plan at this time.

#### ***4.4 Servicing – Process for Product Maintenance***

Servicing of all COTS hardware and software will be covered under the respective product warranties and maintenance contracts. Section 2.8 details the process for SAFS product maintenance.

## 5.0 Product Assurance

This section describes the processes and procedures that will be followed in order to assure that the product developed satisfies the customer's requirements.

### 5.1 Assumptions and Constraints

It is assumed that all COTS products will meet or exceed all specifications included in the purchase request and will be year 2000 compliant.

### 5.2 Quality Assurance

This section describes the processes and procedures that will be followed in order to assure that the customer receives a quality product.

#### 5.2.1 Control of Non-Conforming Products

Nonconforming products on GN controlled SAFS systems will be reported using the discrepancy report (DR) forms found at the EPGS Maintenance Database web site. Non-conformance reports (NCR) will be used where appropriate. Reports of nonconformance will be reviewed, tracked, and maintained by the SAFS Team. An assessment of the impact of the nonconformance to the schedule, budget, and delivery of the product will be made by the SAFS Team and reported to the customer. The SAFS Team will maintain a quality record of changes made to the system in response to a nonconformance report.

The customer will have the authority to use or refuse to use the product in an operational environment.

#### 5.2.2 Corrective and Preventative Action

Error in process on GN controlled SAFS systems will be reported using the CCR/DR forms found at the EPGS Maintenance Database web site. Reports of nonconformance will be reviewed, tracked, and maintained by the SAFS Team. An assessment of the impact of the nonconformance to the schedule, budget, and delivery of the product will be made by the SAFS Team and reported to the customer. An analysis of any nonconformance reports will be made by the SAFS Team to look for trends that would suggest areas for preventative actions.

Because the SAFS system supports multiple projects and is integrated with other systems, the best preventative approach is to keep communications open to the flow of information between the projects, the ground stations, and the SAFS Team. Another preventative measure is to ensure that the SAFS system is thoroughly tested before any new release.

#### 5.2.3 Control of Quality Records

Quality records associated with the SAFS development effort will be maintained and controlled by the SAFS PDL, the Quality Records coordinator, who maintains the list of the quality records, which will be linked to the SAFS web page at <http://www.wff.nasa.gov/~websafs/>. When changes occur to the Quality Records list, the Quality Records custodian for 584W will be given a signed copy of this list.

#### 5.2.4 Control of Documents and Data

The SAFS PDL controls all documents generated by the SAFS Team. Change requests are submitted to the document owner, who reviews the change with the affected customers, and the CCB when required. The negotiated change is given to the SAFS PDL for approval and installation.

### 5.3 Configuration Management

Configuration management will be applied to all components delivered or developed during this effort and will be base-lined as of June 1<sup>st</sup>, 1999. Management of software and system configuration changes for the GN controlled SAFS systems and the Central SAFS system requires ECMB approval prior to system integration. Management of software and system configuration changes for non-GN SAFS systems will be required only where a CCB is defined.

Subsequent builds or deliveries will result in incremental versions of the SAFS system in any or all functional areas. All configuration control changes are coordinated within the SAFS Team, and are the responsibility of the SAFS PDL. After I&T, a **SAFS Release Notice** will be signed by the GN Project Lead and SAFS PDL that describes the changes and/or additions to the SAFS systems. All **SAFS Release Notices** are maintained as part of the SAFS system's quality records. We will document NCR's on **SAFS Release Notices** with workarounds. All supported documentation and records will be maintained until the system has met its development requirements, at which point this documentation will be turned over to the customers.

#### 5.3.1 Identification and Traceability of Products

A formal **SAFS Release Notice**, signed by the GN Project Lead and the SAFS PDL, will become a part of the SAFS system's quality records. The release notice will include an identification of components that comprise the released product as well as any known constraints or restrictions.

#### 5.3.2 Control of Customer Supplied Elements

Control of funding and test plans will reside with the supported SAFS projects.

## 6.0 Plan Update History

Version	Date	Description	Affected Pages
1.0	June 21, 1999	Original	All
1.1	February 9, 2000	Update to ISC PD, Rev. D (9/1/99)	All

## 7.0 ABBREVIATIONS AND ACRONYMS

The following alphabetized list contains the definitions of the abbreviations and acronyms used in this document:

ADEOS	Advanced Earth Observing Satellite
ASF	Alaska SAR Facility
CCB	Configuration Control Board
CCR	Configuration Change Request
COTS	Commercial Off the Shelf
CSC	Computer Sciences Corporation
CSOC	Consolidated Space Operations Center
DMR	Detailed Mission Requirements
DR	Discrepancy Report
ECMB	EPGN Configuration Management Board
EOS	Earth Observing System
EPGN	EOS Polar Ground Network
EPGS	EOS Polar Ground Station
FIDDI	Fiber Distributed Data Interface
GN	Ground Network
GSFC	Goddard Space Flight Center
I&T	Integration and testing
ICD	Interface Control Document
ISC	Information Systems Center
NASA	National Aeronautics and Space Administration
NCR	Non-conformance Report
NISN	NASA Integrated Services Network
PDL	Product Development Lead
PDR	Preliminary Design Review
QuikSCAT	Quick Scatterometer
SAFS	Standard Autonomous File Server
SAR	Synthetic Aperture Radar
SGI	Silicon Graphics, Inc.
SPS	Small Purchases System
WFF	Wallops Flight Facility